PROCEEDINGS

OF

THE AMERICAN MICROSCOPICAL SOCIETY.

MINUTES OF THE FIFTEENTH ANNUAL MEETING.

Held at Rochester, N. Y., August 9th, 10th, 11th, and 12th, 1892.

TUESDAY, *August 9th, 1892.*

The members assembled in Anderson Hall, University of Rochester, and at 10.15 o'clock were called to order by the President, Professor M. D. Ewell, of Chicago, Illinois.

Professor S. A. Lattimore, of the University of Rochester, then delivered the following address of welcome:

Mr. President, Ladies and Gentlemen of the American Microscopical Society: It has been made my delightful duty to welcome you most cordially to the city of Rochester on behalf of the local committee, whose pleasure it has been to provide as best they could facilities for your annual meeting, and also on behalf of the various scientific and literary societies which they represent.

Your former meeting in this city eight years ago, which was so largely attended and so highly enjoyed, both by guests and hosts alike, marked the beginning of many personal friendships, which we earnestly hope may be renewed and strengthened during your second visit.

One of the happy results of that meeting was the kindling in so many of our citizens of an interest in the special fields of study and of scientific investigation which you have so successfully pursued, and the results are distinctly visible to-day.

While it is properly regarded, both by yourselves and others, as the chief function of scientific organizations such as yours to discover the facts and laws of nature, still another function, scarcely if at all

secondary to it, in my opinion, is the influence you unconsciously and unavoidably exercise, of creating in others a love for the scientific study of nature. This is one of the happiest results of your annual visits to different parts of our country. We earnestly hope that your present meeting, in still higher degree than the former, may not only prove delightful and profitable to yourselves, but also prove a source of inspiration to our own citizens, whose benefactors you will thus become.

We therefore feel that we have the best of reasons for greeting your coming most cordially. This University opens wide its doors to receive you and places its lecture-rooms at your service. It spreads before you for your enjoyment its spacious campus, with its quiet walks and its swards of green, while its broad-armed elms spread their leafy shade above you in generous welcome.

Be assured, Mr. President, Ladies and Gentlemen of the American Microscopical Society, on the occasion of your fifteenth annual meeting in the city of Rochester, of a most sincere and cordial welcome.

To which Professor Ewell replied as follows:

Members of the Reception Committee, Ladies and Gentlemen of the City of Rochester: In behalf of the members of the American Microscopical Society assembled in your beautiful city upon the occasion of their fifteenth annual meeting, I tender you individually and collectively our sincere thanks for your generous welcome.

It would be improper now to consume valuable time in extended remarks, but I wish to bespeak for our Society the inspiration of your presence at our meetings and a continued interest in our discussions. We want to become better acquainted and to interchange views, to stimulate each other to renewed efforts for the discovery and elucidation of truth. It should never be forgotten that there is no longer danger to life, liberty, or property from the avowal of scientific heresy. Our discussions should therefore be characterized by the utmost freedom, without which error may be accepted as fact.

Our principal aim being, then, the discovery and elucidation of truth, I trust that our coming among you may be reciprocally pleasant and profitable.

But I must not consume more time, and, again thanking you, I declare the meeting open for the transaction of business.

The names of twenty-one persons proposed as new members were then read, and, on motion, the Secretary cast the ballot for them, and they were declared elected. Their names will be found at the beginning of the list of members.

The local committee announced the arrangements for an excursion the following day to Ontario Beach, at 4 p. m.

The Committee on World's Fair reported, through Professor Ewell, that by the death of Dr. McIntosh and the absence in Europe of Mr. H. Tolman, the committee was somewhat disorganized, but that in a recent conversation with Mr. Bonney, President of the World's Auxiliary Congress, he found that it was desired to have all the microscopical societies represented at the Exposition to meet in one body as much as possible. There was a building containing thirty halls available, and, while each society was expected to preserve its independence as regards its own business, the papers were to be read before the entire body. Many workers from other lands were expected to be present, and it was desired to hold the congresses in May. This last part of the proposition he thought inexpedient, because many of our members were teachers and cannot leave their work in May to attend a meeting. We should hold our meeting at the usual time, with such other societies as may find it convenient.

The Secretary stated that he thought it best to resign from the Committee on the World's Fair, as it would be better to have some one who could give it more time than he could. This would make two vacancies to be filled.

Professor Rogers moved that the nominations be left to the Executive Committee.

The Secretary stated that Mr. E. H. Griffith had declined the position of chairman of the working session, to which he was appointed last year.

Mr. J. D. Hyatt said he did not come prepared to take part in a working session.

It was moved and carried to refer the matter to the local committee.

Mr. H. H. Turner stated that he had received only about twenty replies from intending exhibitors at the soiree on Thursday evening, to be held at the Arsenal, and requested prompt information from all who proposed to take part.

Professor Claypole reported from the Committee on Universal Screw that the Germans were considering the matter by a committee

appointed by the Convention of German Opticians and Mechanics, held at Frankfort last year, and as their report was not yet complete, it was better to wait and see what they would do.

The Secretary asked what were the supposed advantages of the Butterworth or broad-gauge screw, and if the same or a similar result could not be obtained by shortening the objective tube.

Mr. Ed. Bausch said that he and Professor Rogers were appointed a committee in 1884 on this subject. It was found to be impracticable at the time to make taps uniform, and the matter was dropped. Professor Abbe had stated he would be willing to coöperate with other makers. I think a broad-gauge is a thing of the past; the tendency is to reduce size and use smaller instruments than heretofore. We should endeavor to get a standard which is a standard. The taps sent out by the Royal Society of England vary in diameter.

Dr. Blackham: I fail to see any advantage in the wide screw. There is no advantage in making our instruments more bulky. For the lower powers our present screw is fully suitable.

The Committee on Universal Screw was continued, to report at the meeting next year.

On motion, the Chair appointed Professors Claypole and Rogers to audit the accounts of the Treasurer.

The first four articles of the new constitution, as recommended by the Executive Committee, were read and then considered separately.

On reading article I, on the name, Dr. Blackham objected that it was out of order, that the incorporation last year was not properly done, since a year's notice of such action had not been given.

The Chair ruled the objection was not well taken.

Dr. Blackham: It is not honest to take the name of another society, and I move the article be rejected.

Motion was made that the article be adopted.

Mr. E. Bausch: What would be the effect of rejecting it?

The Chair: As it is in the act of incorporation, it is part of our organic law.

The Secretary read from last year's minutes to show the circumstances attending the act of incorporation at Washington, D. C.

Article I was then adopted, and the three following articles were adopted without discussion.

An invitation to meet in Brooklyn, N. Y., in 1894 was presented from the trustees of the Hoagland laboratory and referred to the Executive Committee.

An invitation was read from the Bausch and Lomb Optical Co. to visit their works on Thursday afternoon.

Then adjourned to 8 p. m., to listen to the address of the President.

The Executive Committee met at 9 o'clock a. m., and at 2 p. m. to arrange the business of the Society.

TUESDAY EVENING, *August 9*—8 o'clock.

The Society and its friends assembled in Music Hall, Y. M. C. A. building, and listened to an able address by the President, Prof. M. D. Ewell, on "The use of the microscope in the administration of justice."

WEDNESDAY, *August 10, 1892.*

The Society assembled at 10 a. m., and the names of six new members were presented, and they were elected.

The last five articles of the Constitution were then read, amended, and adopted in the form in which they appear at the end of these minutes.

When article VII was read, Dr. J. A. Miller moved to make the annual dues three dollars, but the amendment was lost on a show of hands.

The Society then proceeded to select a Nominating Committee, and the following names were presented by open nomination: J. D. Hyatt, Wm. A. Rogers, S. H. Gage, Geo. E. Blackham, Ed. Bausch, D. S. Kellicott, J. A. Miller, Lyman Deck, and W. C. Krauss.

Dr. Blackham declined to serve.

It was moved that the Secretary cast the ballot of the Society for the names as written on the board.

Dr. Miller desired to withdraw his name.

The remaining names were then declared elected.

Professor Gage then read his paper, "On methods of decalcification in which the structural elements are preserved."

Mr. Hyatt asked how they were cut and mounted.

Professor Gage: Two solutions of gun-cotton were used, one thick and the other thin. The latter has two grams of gun-cotton to 100

c. c. of solvent; the other five. They were saturated and imbedded with these, cut and stained with any kind of stain, and mounted in balsam.

Professor Gage then continued with his paper on, "A hæmatoxylon solution that does not readily deteriorate." (Specimens were shown.)

Professor Claypole: Can you explain the action of chloral hydrate in preserving the solution?

Professor Gage: It is a matter of experience that weak solutions of some germicides prevent the growth of germs which the same solutions do not destroy when the germs are developed.

Dr. Krauss: Could not chloral hydrate be used for all staining solutions?

Professor Gage: For solutions in which no free ammonia was present. Ammonia would produce chloroform from the chloral and a precipitate would result.

Professor Lattimore had used thymol with good results.

The Secretary noted the use of listerine also.

Mrs. S. P. Gage then exhibited and described a model of the brain of Diemyctelus constructed of patterns of serial sections cut from paper and set in narrow grooves in a board. The internal structure was drawn on the sections.

President Ewell said that last summer he saw in Butte, Montana, a model of a mine constructed in a somewhat similar way from sheets of glass, so that it was transparent. In reply to questions Mrs. Gage said the brain was prepared as had just been described by Professor Gage, and the cuts in the board were made in due proportion.

Dr. Blackham remarked that photographic films that had a mat-surface and were therefore easy to draw on could be used for the sections.

Dr. Krauss then read his paper on "The diagnosis of tumors."

Professor Gage: Do the tumors arise in the or from the meso-blast, and at the same time simulate an origin in the hypoblast or epiblast, by a sort of atavism, since we know that the epiblast is the original layer?

Dr. Krauss: Yes; but their origin is often mixed, except that it is rare to find them originating in both hypoblast and mesoblast.

In response to a question as to preparing fluids Professor Gage said: Fresh tissue should never be put into water. It is a liquid foreign to organic tissues. In the study of biology the student should first become acquainted with normal structure. Students

were usually very anxious to see pathological specimens, which he kept away from them as long as possible, but occasionally he would let them see something pathological, and when they found out they could not tell anything about it, they were ready to go back to normal structure.

Dr. Lester Curtis: There are some important sources of error in diagnoses of this class. In one case an excellent physician pronounced the disease carcinoma of the stomach; another equally good thought it was simple inflammation. After the post mortem a specimen was brought before the medical society. There was no malignant growth to be seen; the secreting cells were all destroyed by inflammation, leaving only cicatrized tissue. I was young then, and careful attention was not given to it. A few years after a similar specimen came into my hands, and I made hundreds of sections, and at first only saw cicatrized tissue, but on following it I came finally to carcinomatous cells. The growth had progressed, and only left behind it the débris. I have seen carcinoma of the mammary gland, where only a cicatrix was to be found at first until the borders or edge of the cicatrix would be reached, and there cancerous cells were found. My experience is that every one is not a thorough expert, and hence mistakes are often made.

Dr. Krauss: My object in presenting this paper before the Association is not to call attention to well-established facts concerning tumors and their characteristics, but to impress and emphasize the importance of a thorough and complete examination of a tumor before a diagnosis is established. By studying carefully its manner of growth, its location, its appearance, consistency, size, etc., we can in many cases obtain information which may suggest a diagnosis. The microscopical examination should never be omitted, because it either confirms or annuls a suspected diagnosis. Moreover, a tumor growing on daugerous ground, by that I mean those localities which are prone to carcinomatous changes, should be examined early and often, and if there is any suspicion of malignancy several well-trained pathologists should be called upon before a definite conclusion is arrived at. A single examination by one pathologist only means very little if the character of a suspected growth is to be determined with a view of operative procedure. Several examinations by different pathologists should be made and those opinions which harmonize with the clinical history of the growth should be heeded.

Professor Gage then opened the discussion of the working session at the World's Fair. He said Professor Burrill, of Champaign, was

chairman of the Auxiliary Committee on Microscopy, but that he had nothing to do with the working session, and that he, Professor Gage, had embodied his suggestions in the circular which was sent out in April of this year.

President Ewell: We should decide if we will preserve our autonomy or coöperate with Professor Bonney. He wants to hold several congresses to discuss all the great questions of the day. To have these unified this Society must surrender its individuality, except as regards its regular business. All papers must be read in the congress.

Professor Kellicott: Is this plan published?

President Ewell: The Section on Jurisprudence have sent out an address suggesting subjects for discussion, and have named eminent men to assist. At the same time societies have a local pride that objects to such a merger of themselves.

Professor Gage: I move this Society join the World's Fair Auxiliary Congress.

The motion was seconded.

Professor Kellicott: Does this come as an invitation?

President Ewell: Yes, I am authorized to extend this invitation.

Professor Rogers: It is beyond the power of any set of men to secure the object sought. I am vice-president of a section. It is not made up of men who will command confidence.

President Ewell: Mr. Bonney will make such changes as can be shown to be necessary, if he is requested.

Professor Rogers: Only one name is among the astronomers that will command confidence and secure the coöperation of the best men.

Mr. Schultz: Can this Society go before the World's Fair as such? Would they have any standing, any halls, etc.?

President Ewell: I shall be in a position to control halls. The auxiliary has at its command about thirty halls.

Professor Kellicott: Is the time fixed?

President Ewell: Mr. Bonney desires to hold the Congress in May. Many of our members are teachers, and cannot come in May.

Professor Gage: I made my motion to bring the matter before the Society. At the French Exposition we had a Congress of Zoologists, but here I do not see how we can do anything at the dictation of one man. He has appointed Professor Burrill, who is near him.

Professor Claypole: I agree with what Professor Gage has said. I have seen some correspondence on a kindred affair, and I doubt if it will be a success as far as we are concerned or as far as anybody is concerned. If anything is done we ought to take the lead as a scientific society. Visitors will come in July, August, and September. May is out of the question. We had better make our plans and let them be known in Europe; they will have more confidence in us.

On taking a vote it was unanimously resolved not to take part in the congress.

Dr. Krauss: What is to be done about the working session?

Professor Rogers said we should push the working session and do all we can to help Professor Gage.

Mr. Tiffany moved that Professor Gage be empowered to select his own assistants.

Passed.

Professor Hyatt requested the Nominating Committee to meet at the close of the meeting.

Adjourned to meet at 2 o'clock, at Sibley Hall.

WEDNESDAY AFTERNOON, *August 10, 1892.*

The Society assembled at Sibley Hall, where provision had been made for lantern-work.

The Rev. D. W. Smith was called, and also Dr. Sternberg, but, owing to a misunderstanding, neither was present.

Dr. Lester Curtis read a paper on "Bacteria in healthy human blood."

Dr. Miller: What objectives did you use?

Dr. Curtis: Powell and Lealand's and Gundlach's one-twelfth. No cultures were made, and the slides were sealed. The bodies remained moving for some time.

Dr. Miller: Was there any evidence of reproduction?

Dr. Curtis: I am not sure; they take stains like bacteria.

Dr. Miller: If we find bacteria in the blood, there must be something there also which devours or destroys the bacteria—either a phagocyte or an enzyme or a ferment. I hope that cultures will be made. At present it is unsafe to draw conclusions.

It was asked if motion was due to liquid or to cilia.

Dr. Curtis: They had a distinct motion, as the bacteria from an open abscess will have, displacing other bodies that lie in their way.

It was stated that long bodies covered with cilia had been found in the blood of frogs.

Professor Claypole: Of what size were they.

Dr. Curtis: Round, about the size of a micrococcus.

President Ewell then read a paper on "The concave glass mirror, and reflection from the two surfaces thereof."

Professor Claypole: Has any confusion been traced to this source?

Dr. Blackham: I am very glad that this question is brought up. I have long used the concave mirror with a bed-room lamp in difficult work with high powers, and I came years ago to the conclusion that the radius of curvature of the concave mirrors fitted to most microscopes was too long; so when I sent my specification for an instrument to Mr. Tolles one item was that the mirror should have such curvature and movements as to focus on the object parallel rays and rays from a radiant distant not more than twelve inches. I found a slight effect due to the two surfaces, but the difference of focus is very small, and the reflection from the anterior surface is so weak that it is practically obliterated. For persons who make use of Abbe condensers the slight amount of error is not worth talking about. The Abbe condenser is the worst piece of illuminating apparatus that has been or can be constructed. I use a small kerosene lamp, with the edge of the flame turned to the mirror. The mirror should be of larger diameter, with a principal focus of two or four inches.

President Ewell: I always used Bulloch's mirror, having a diameter of about 75 mm.

Dr. Miller: I am with Dr. Blackham. I have had occasion to examine many mirrors; they are carelessly made, and would be suitable if the stand were 8 to 10 inches above the table, but do not come to a focus at the ordinary distance. I have one 40 mm. in diameter, with a focus of 75 mm., that gives a perfect point, and I use it with a homogeneous immersion lens and small lamp, and I can see the tubercle bacilli as perfectly as with an Abbe condenser. Mirrors should be parabolas, and the source of light should be a point, as the electric light.

Dr. Blackham: I use a Hitchcock mechanical lamp with no chimney and the wick turned down till a small triangle of white flame appears above the metal cone. My difficulty has never been to get sufficient light, but to avoid glare from over illumination.

Professor Rogers: Let any one trace the course of the rays when there is a glare of light and it will be found that it is produced by the rays from the outer edge of the mirror, and that if these are cut off by a diaphragm so that the angular pencil of rays does not exceed 15 or 16 degrees on either side of the axis, all the rays will reach the principal focus, giving a clear definition.

Professor Gage: Dr. Blackham has spoken of the Abbe condenser as a condensation of errors, but discoveries have never been so important as since the Abbe condenser came into general use. If you go into any laboratory you will find Abbe condensers.

Dr. Curtis: I have a Bulloch stand with a concave mirror that will focus that I use on test objects, etc., and also a Powell and Lealand achromatic condenser of about 110 degrees, which stays on the stand all the time and which I think superior to the Abbe, which I rarely use, except for diatom-work. The Powell and Lealand gives a good definition all over the field, and I can make out details with great precision. I get the light straight through the middle of the object to the eye, and the Powell and Lealand is the only thing I have ever used that gives me that sort of light.

Dr. Blackham: Will Dr. Curtis explain how he gets central light?

Dr. Curtis: I have a series of diaphragms from the size of a pin-hole up. The pin-hole does not give me quite light enough, so for ordinary work I use the second.

Dr. Blackham: I fail to see how the diaphragms do anything but diminish the aperture below. It is precisely equivalent to turning the light down.

Dr. Curtis: When the angle is acute at which the rays strike the object we have practically parallel light, and the small pin-hole gives no flood of light surrounding the object, but the point is as brightly illuminated as any part of the field could be.

President Ewell then read his paper on "Numerical aperature."

Dr. Blackham: When measuring as I do the definition is with some objectives lost before the field becomes dark. The available angle for good definition is much less than the full angle for admission of light.

All light beyond the available angle for good definition may be diaphragmed out with benefit. The point I make is that measurements with the apertometer or any other telescopic method are illusory. Such methods give the angle for the admission of light, which may or may not coincide with the angle for good definition, and in all but the best lenses largely exceeds it, so that this method

gives an apparent advantage to the inferior lens. The only way to measure aperture is with a test object resolved in the field, and the source of illumination swung round it as a center till either illumination or definition fails. This is the R. B. Tolles method.

President Ewell: I did not make any tests for available light or optical performance.

Professor Claypole: To what is the discrepancy due, between the marks of the maker and yours?

President Ewell: I cannot say. There is no technical difficulty in measuring aperture.

Mr. Griffith: Were the measurements made on several objectives of the same series, as, for instance, several quarter-inch student series?

Dr. Blackham: The aperture of the Zeiss objectives was probably determined with the Zeiss apertometer, and the others are marked with the calculated aperture. Now if 100 lenses are ready to make up, there will be a slight difference in construction, some variation in the amount burnished down will occur, which will cause some variation from the calculated aperture. The only safe way is to mark each objective just what it is found to be.

THURSDAY MORNING, *August 11, 1892.*

On the opening of the session, Mr. Augustus A. Young was elected a member. The Secretary stated that great inconvenience had been experienced because the titles of papers had not been sent in to the Secretary in due season, so that the program could be made up before the opening of the meeting. When he left Washington, the day before the meeting, he had received the titles of only four papers besides those of the President, and hence the printing of the program had been much delayed. On the opening of the meeting, as soon as members arrive, they would find it advantageous to go as soon as possible to the place published in the circular as headquarters, and would find there all information about the meeting. The Executive Committee usually met at headquarters at 9 o'clock on the morning of the first day of meeting.

The By-Laws prepared by the Executive Committee were read as a whole, then taken up article by article.

Article I was adopted as read.

Article II was read, and Dr. Miller made some remarks about microscopical journals, and the article was then adopted.

Article III was adopted without debate.

On reading Article IV, Mr. Clark Bell moved to add the words "except by consent of the Executive Committee."

The article, as amended, was adopted.

On reading Article V, Professor Claypole moved to amend by substituting "may be dropped" for "shall be dropped from the roll."

The amendment was rejected, and Article V and the remaining articles were adopted as read without further debate.

Mr. Clark Bell then read his paper on "Blood and blood stains." He said the illustrations were all prepared and would be loaned to the Society, if the paper was published, without expense to the Society.

Dr. White: We cannot say that any given blood is human, but we can often say it is not human, which is often quite as important. The blood is not affected by ordinary diseases to alter the size of the blood corpuscle.

President Ewell: You will find reported in the North American Practitioner for March and April, 1890, a case in which the corpuscles were larger than usual.

Mr. Clark Bell: Were they not degenerated?

President Ewell: No; they were anæmic and of a larger diameter.

Dr. White: As Dr. Woodward, in his testimony before the court in the New Haven case, said he included in his measurements one-half of the shaded rim of the corpuscle, the possible differences in micrometers ought not to exceed 0.01 per cent., and this possible error is not sufficient to bring the average size of the corpuscles of domestic animals up to that of man. Dr. Woodward in 1879 showed under oath the large size of the corpuscles of a dog, but he selected large corpuscles, and thus got large averages.

Mr. Clark Bell: No author claims that the corpuscles of dried blood are larger than those of fresh blood.

President Ewell: I have examined the blood of a dog daily from the time it was two days old until it was six months old. At first the disks were larger than human; they then diminished until they became smaller.

Dr. L. Curtis: The whole subject is in confusion. No conscientious observer will appear in a court of justice and swear that a certain stain is human blood. I move a resolution as follows:

Resolved, That it is the opinion of this Society that in the present state of science there is no means of determining that any particular sample of blood is human blood.

The resolution is too sweeping.

Professor Kellicott: My feelings are in sympathy with the resolution, but I hesitate to place the Society on record.

Dr. White: I am afraid the resolution will produce the impression that medical testimony is of no value. The question in the celebrated Lindsay case was whether certain stains were man's blood or pig's blood. Dr. Richardson demonstrated that the stains were human blood, and was willing to stake his life on the result.

Dr. A. C. Mercer: I do not think it proper for this Society to put itself on record in any such way. I heard much of the Lindsay trial, and saw Dr. Richardson's preparations. As the facts of the case narrowed the question submitted to Dr. Richardson as to whether certain stains were human blood or pig's blood, Dr. Richardson was able to say—and could be made to say only—"If this blood be man's blood or pig's blood, then this blood is man's blood." Undoubtedly other cases will occur in which peculiar circumstances will make it possible to say that a "particular sample of blood is human blood." It would be absurd and incompatible with the dignity of this Society to officially express a contrary opinion.

Professor Claypole then described the action last year on a similar motion, which was negatived.

Dr. Gleason: Do we see what we see, or don't we see what we see?

Dr. Miller: We are not all experts in one thing. We are not all devoted to blood; some study plant life, some other things. Now, we have men on both sides of this question, and it would be manifestly unwise to attempt to settle it here. I move to lay the subject on the table.

Dr. Miller's motion was seconded, and the subject was laid on the table.

Professor Kellicott then read his paper on "A crustaceous parasite of the miller's thumb." (Cottus.)

Professor Kellicott then moved that the President appoint a committee on necrology. Carried.

The President appointed Professor Kellicott, Dr. Curtis, and Professor Rogers. Mr. E. L. Griffith was subsequently added.

Dr. Howe's paper was then called, and paper and illustrations not being on hand were sent for.

Mr. George Rafter then delivered an address on the subject of "The examination of potable water for bacteria." Copies of his paper before the Rochester Academy of Science on the subject were distributed, and the value of an examination of the watershed of a water supply for the comparative numbers of bacteria present was explained and supported.

Dr. Sternberg: This work is as valuable as counting the colonies of bacteria. Bacteriologists have given up the idea that valuable information is gained by counting bacteria. The question is, are pathogenic bacteria present? There are four methods of examination to determine if a water supply is good. The first and most important is the environment. The number of bacteria in colonies varies. The most common are harmless, as well as the diatoms and desmids. If typhoid bacillus or cholera spirillum are present it, of course, condemns the water. Some bacilli pathogenic to the lower animals are harmless to man.

G. W. Rafter: The speakers did not quite understand all I said. Pathogenic bacteria lie at the base of sanitary engineering. For all kinds of examination too much time is required, more than can usually be given. As between chemical and bacteriological analysis, to decide purely on the evidence afforded by the first without biological study would be rash. Study the environment; take a guide acquainted with the country, and go over it with the microscope, stopping here and there on the watershed, by the pool, etc., make your counts, and in an hour you will come back with more information than can be got in any other way. Biology gives more information then chemistry.

Dr. L. Curtis: A few years ago an investigation by the State Board of Health was made on the number of germs in running water, but it was not completed for the following reasons: It was found that the number of germs in water confessedly impure, as where the Chicago river was pumped into the canal, and at Bridgeport, where the water was most contaminated by sewage, was much smaller than 50 or 60 miles down the river. Now, I cannot explain or give any reason for this, but it is so.

THURSDAY AFTERNOON, *August 11*—2 p. m.

The Society proceeded promptly to work, and President Ewell read his paper on "The examination of 1,000 signatures of the same person."

Professor Rogers: One may draw wrong conclusions from the probable errors of curves. Your computation is a certain quantity from which constant errors are excluded.

At the close of the discussion on this paper the remainder of the session was occupied by Dr. George M. Sternberg and Dr. A. Clifford Mercer, who exhibited a large number of lantern slides, and for this purpose the Society had assembled in Sibley Hall, which was arranged to be darkened for the use of the lantern by day.

Dr. Sternberg's paper was entitled "Photomicrographs by gaslight," and consisted of a number of slides illustrating bacteria in great variety photographed by gaslight.

Dr. Mercer's paper was called "Photomicrographs and Photomicrographic apparatus." A variety of objects were shown and also a number of views of the apparatus used in taking them.

In answer to a question at the close, Dr. Mercer said the best lantern plates were Ilford (English) plates, the so-called "Alpha" plate.

At four o'clock the Society took the cars in waiting and proceeded to the works of the Bausch and Lomb Optical Company.

They are situated on North St. Paul street, No. 515, near the Genesee river, which, however, does not give them any power, that being furnished by a steam-engine.

The establishment was begun in 1859 as a spectacle factory, and has gradually increased until it is now one of the largest in the world devoted to making optical goods. There is at the present time 44,500 square feet of floor space, and about 500 hands employed, and an addition is in process of construction which will add about 62,000 feet in area and about 200 hands to the present plant. The new part will contain a Harris-Corliss engine of 500 horse-power that will furnish power for the entire establishment. Spectacle glasses, microscopes, and photographic goods are the principal lines of work.

Until this year optical glass was all imported, but its manufacture has now begun in this country, and the first exhibit of American-made optical glass was opened at this meeting in the hall of the Rochester University. Disks were shown 30 cm. in diameter and 4 cm. thick, free from striæ and perfectly annealed, made by the firm of Geo. A. Macbeth & Co., of Pittsburg, Penn. These disks are first ground on opposite sides so that they can be looked through to see if they are perfect, and are then stored till wanted. For some lenses the glass is pressed into nearly the shape required. A pair

of small scales were shown with a piece of flint glass on one side and a piece of crown three times as large on the other, and yet the scales balanced, that being nearly their relative specific gravities.

The general methods of making lenses are nearly the same for all kinds. It consists of making a pair of metal patterns or shells having the shape of the surface of each side of the lens, and then cementing the rough lens to one with pitch, while the other is rubbed over it with the aid of grinding powders of different degrees of fineness. First coarse emery is used, then fine emery, then rouge. The latter is merely a particular kind of iron oxide, some forms of which are also known as Venetian red. Every particle of a coarser powder must be carefully washed off before a finer is applied, or scratches would result.

The finer microscope lenses have to be made by hand, one by one, the laps or shells being on the end of little handles not larger than lead-pencils, and the opposite lap being kept wet with ice-water and rapidly turned by a spindle in the bench before the workman. Sets of finished glasses lying in the boxes look like gems.

Spectacle glasses are made by machines working automatically, carrying 18 shells on a side and from 150 to 300 glasses on a shell. About four hours' grinding is required for each set and an hour for washing off, the grade of emery being changed each hour, four grades being used. One hundred gross pairs of spectacle glasses a day are sometimes made, and when put into frames and finished the cheapest sell at wholesale as low as forty-five cents a dozen. The system of grinding by which numerous glasses are ground on one shell enables the firm to make cylindrical glasses for the correction of astigmatism at wholesale rates—something unheard of when they began. One of the nice little operations is drilling the frameless glasses with a little hole close to the edge with a diamond drill wet with turpentine. The celluloid frames are punched out of sheets of celluloid heated on steam tables, grooved to receive the glasses by milling cutters in pantagraph frames, then polished, and strung on small rollers to be sent upstairs to the girls, who insert the glasses, put them together, and pack them for sale. Each pair of glasses, in its different parts, passes through from sixty to seventy pairs of hands before it is complete.

The metal work of microscope stands is made very largely by milling machines and turret lathes. The first are run with high speed and slow feed, to finish with one cut instead of two, the single

cut leaving the work finished. The turret lathes carry all the tools required to finish a given piece, say an adapter, on a revolving tail stock, whereby a slight turn brings each one successively into action.

Arrangements are now being made to cut the racks on the better class of microscopes, with a spiral tooth, similar to that used for some time on the Zeiss instruments.

This brief description is not intended to be complete, but only to touch on those points likely to be of interest to the members of our Society. At the conclusion of the visit a collation was served in the room adjoining the office, used as a dining-room for the employés, where a vote of thanks to the firm was unanimously passed by the Society, and briely responded to by Mr. Edward Bausch.

It is worthy of mention that, in addition to the development of his business, Mr. Henry Lomb has been particularly interested in plans for the improvement of the working classes. For some time a room was set apart in the factory and teachers employed to give evening instruction to the numerous young employés who were disposed to attend. This arrangement has now been enlarged and separated from the works, and is carried on as the Mechanics' Institute of the city of Rochester, having about 800 on its books, and an average attendance of some 600.

In addition to this, Mr. Lomb has been interested in sanitary matters, and in 1885 offered certain prizes, through the American Public Health Association, which resulted in the publication of what are known as the Lomb prize essays, on "Healthy homes and foods for the working classes," by Dr. Victor C. Vaughan, and on "Disinfection and individual prophylaxis against diseases," by Dr. Geo. M. Sternberg, 1886, both of which are recognized as among the best books on the subjects of which they treat.

The Annual Soiree.

Thursday evening, commencing at 8 o'clock, the annual soiree was held in the Arsenal. Arsenals have been used several times for our soirees, and seem well adapted for the purpose. There were about 100 microscopes in actual use, and a large attendance of visitors.

Besides the usual objects familiar to frequenters of such exhibitions, which are nevertheless interesting to the public, because the public do not have the opportunity of seeing them very often, there was an exhibit of the stages of development of the star-fish that in-

terested visitors so much as to hold a dense crowd around the table from the beginning to the end of the soiree. The slides were those of Prof. Chas. W. Dodge, and were explained by means of sketches and brief typewritten descriptions. The stages shown were (1) the mature ovarian egg, showing its structure before it leaves the body to be fertilized; (2) the egg, taken a few minutes after leaving the body, preparing for fertilization by the formation of the polar globules; (3) the egg thirty minutes after fertilization, showing the two cells whieh result from the first segmentation; (4) one hour after fertilization, showing the four cells resulting from the second division; (5) the eight-cell stage; (6) the sixteen-cell stage; (7) twelve hours after fertilization, the cells now forming a hollow sphere (blastula), which is ciliated and rotates inside the egg membrane; (8) twenty-four hours after fertilization, one side of the sphere becomes invaginated, thus forming the gastrula, the egg leaves the egg membrane and swims around in the water; (9) two days after fertilization, the young Bipinnaria, an early larval stage; (10) the Brachiolaria, an older larval stage; (11) a Brachiolaria, showing the form of the young star-fish at one end; (12) young, fully formed star-fishes about a sixteenth of an inch in diameter, showing the rudimentary rays, spines, ambulacral feet, plates of the skeleton, stomach, mouth, &c.

FRIDAY, *August 12, 1892.*

The Society met at ten o'clock a. m.

After some discussion, Professor Kellicott moved that the arrangements for the Columbian Exposition be left in the hands of the Executive Committee.

Carried.

Dr. H. Povall was elected a member.

Professor Kellicott described the present relations of the time of meeting of the Society to other national scientific societies, and Professor Claypole stated that some effort would likely be made by the Geological Society to induce the American Association for the Advancement of Science to postpone its date of meeting for one day, beginning its sessions on Thursday in place of Wednesday, and this change if adopted would give three days at the beginning of the week for the other societies to hold their meetings, and allow those attending to continue right on with the American Association for the Advancement of Science without losing four days between the sessions of the societies, as is now the case.

It was resolved that Professors Kellicott, Rogers, and Claypole should be constituted a committee to represent this Society, in case any opportunity should offer, to make arrangements favorable to the interests of the Society.

The report of the Treasurer was then read and adopted. It is printed at the end of these minutes.

It was then announced that a member of the Society had arranged to furnish the sum of 240 dollars in prizes for the best two papers containing the record of original research in plant and animal life, and also for slides and photomicrographs.

The Society accepted the donation with earnest thanks, and appointed, through the Chair, Professors Gage, Kellicott, and Seaman a committee to prescribe the conditions of competition.*

Mr. E. L. Griffith then read a paper on "Some new accessories for the microscope."

Prof. W. A. Rogers presented a paper on a filar micrometer recently made for him.

President Ewell remarked that the movement of some instruments of this kind was so stiff as to render them useless for accurate measurement. The milled head must turn with great ease.

Professor Rogers then continued with a paper on "The microscope in the workshop."

Professor Lattimore said that it would have been of great service to the inventors of photographic films if they had been acquainted with the best way of applying the microscope to secure a plane and level surface on the tables on which the films were made. These tables were of plate glass, on which the thick magma was run and on which it dried rapidly, but was of uneven thickness, and the task of leveling them was a very difficult one.

President Ewell: How did Professor Rogers grind the pivots?

Professor Rogers: In the ordinary way, with my precision-screw lathe, with a grinding attachment independent of the lathe. This engine lathe is very massive. The carriage alone weighs over 500 pounds. When they were reduced to the same diameter, they were finished by local correction, using a feeling lever for making the test for irregularities in diameter.

President Ewell then read a description of a ruled plate made by Mr. C. F. Eichorn, of Newark, N. J., containing twenty bands

* This committee, at the close of the meeting, held several sessions and prepared the conditions of competition, which are printed at the close of these minutes.—W. H. S.

ranging from 10,000 to 120,000 to the inch, a heavy-ruled space being made between the fourteenth and fifteenth bands to serve as a finder.

Mr. G. S. Woolman thought the lines were clean and sharp, equalling those of other makers.

Professor Rogers said he had examined the plate, and that it was a very creditable piece of work; the coarser lines not quite as good as those of Nobert.

Professor Claypole then read a paper on "The Society of Arts microscope as a cheap microscope." This instrument was designed and made forty years ago and is still sold in England for about fifteen dollars.

Mr. G. S. Woolman: What does Professor Claypole consider cheap?

Professor Claypole: Twenty to twenty-five dollars.

Mr. E. L. Griffith: What wages are paid by these microscope-makers?

Professor Claypole: I do not know; we have no instrument made on the same plan.

Mr. G. S. Woolman: I sold this instrument for many years at $22.50. It is a miserable instrument. The American makers make much better ones for $30.

Dr. Blackham: When I first commenced to use a microscope I used one of these instruments. It is a little better than the Craig microscope, or a drop of balsam in a pin-hole. The lenses are not as good as a $1.50 pocket magnifier—is is beneath contempt. The value of a stand is to hold the tube steady, and I would rather have a Jackson model and sliding tube than that. The curious system of leverage it possesses magnifies every error of workmanship. The large model known as the Ross, which is similar to it, has been abandoned. The instrument I worked with was so badly made as to be worthless. Such traps are more likely to disgust a student with microscopy than to lead him on.

Professor Rogers: We have here two opinions—one that of an instructor who has successfully used the instrument in the class-room; the other that of a dealer who formerly sold the instrument. It is only fair that both opinions should have their due weight. In regard to the choice between an instrument simple in form but of good mechanical construction, as compared with a high-priced stand, I prefer the former. I use for most purposes a Bausch and Lomb stand costing about $12. It is well to keep in mind that nearly all

the valuable work—*e. g.*, in astronomy—has been done with instruments of comparatively small size. We may go further and say that a large part of the discoveries made in this science have been made with telescopes of moderate power. Dawes made his famous discoveries of double stars with a telescope having an aperture of only 8½ inches. The most of Herschel's discoveries were made with a telescope of small aperture. It often occurs that solidity in mechanical construction more than compensates for increased magnifying power.

Mr. G. S. Woolman: An American stand. The American makers furnish a better low-priced stand than the European.

President Ewell: All microscopes are good, but some are better than others. I would not select the Society of Arts instrument, but let us be tolerant. Some English authorities favor that stand. I would buy a model, such as Brother Blackham has, but let us encourage every one to get a microscope of some sort.

Mr. Turner: I look at this matter from the standpoint of the manufacturer. Men will accept, use, and pay for European work of a worse character than they will take from American manufacturers, and then criticise the latter.

President Ewell: I want to say that the best work in the world is made in the United States.

Professor Claypole: I agree with the President, but this instrument was made forty years ago. Dr. Carpenter was the leading man in getting it made, and advocated it. I maintain that it is better the student should get such an instrument as this and keep up his work than to drop it.

A paper on "The structure of the red blood corpuscles in man," by Dr. M. L. Holbrook, was then read by Dr. S. O. Gleason.

The Nominating Committee then presented the following list of names for officers for the ensuing year, and, being separately considered, the Secretary was instructed to cast the ballot of the Society for each of them, and they were declared elected:

President, Jacob D. Cox, Cincinnati, Ohio.

Vice-Presidents, George M. Sternberg, Baltimore, Md.; A. Clifford Mercer, Syracuse, N. Y.

Secretary for three years, William H. Seaman, Washington, D. C.

Treasurer for three years, Charles C. Mellor, Pittsburg, Pa.

Executive Committee, Lester Curtis, Chicago, Ill.; J. Melvin Lamb, Washington, D. C.; William C. Krauss, Buffalo, N. Y.

President Ewell read the following list of members deceased during the year: Dr. L. D. McIntosh, Dr. Thomas H. Urquhart, and W. H. Bulloch.

Professor Claypole moved the following resolutions of thanks, which were unanimously adopted:

The members of the American Microscopical Society, assembled at Rochester, N. Y., in annual session, hereby tender their hearty thanks to the Rochester Academy of Sciences, through its microscopical section, for the care and pains spent in preparation for their visit and for their convenience during the meeting; also to the citizens of Rochester, who have kindly contributed to their entertainment, and especially to the Bausch and Lomb Optical Company for the opportunity of visiting their extensive works and examining under their guidance the many processes employed in grinding and polishing the lenses used in almost all kinds of optical instruments.

The thanks of the members are also hereby tendered to the press of the city for the fullness and accuracy with which their papers have been reported; also to the trustees and faculty of the University for the accommodations afforded by the use of their building, and to the ladies of Rochester for their attention to the wants of the visiting ladies of the Society.

The following papers were then read by title:

"A new form of continental microscope," by Mr. Frank Zentmayer.

"Scavengers of the blood," by Dr. R. G. Nunn.

"The diagnosis of tumors," by Dr. William C. Krauss.

"The Wenham binocular; can it be made adjustable to a variable tube length?" by Dr. Thomas D. Biscoe.

"On a new mounting-table," and also "A practical drying oven," by W. N. Preston.

"Precious stones as microscopic objectives," by James H. Logan.

"Contributions on the digestive tract of some Ganoids," by Grant S. Hopkins.

"The structure and development of buds in the leaf of *Bryophyllum calycinum*, Salisb.," by W. W. Rowlee.

A paper, which was a report on a case of Elephantiasis of the hand, was also sent by Miss Vida Latham, but owing to miscarriage in the mails was not received by the Secretary until after the meeting.

Professor Kellicott mentioned as an interesting fact which had come to his knowledge that a horse had died infected with Trichina.

Professor Moody: In my study I find the tongues of cats full of Trichina.

Mr. E. L. Griffith: A Government inspector in Omaha fed infected meat to a dog and he died.

Mr. Griffith continued: Although we had nominally no working session this year, in our visit to the Bausch and Lomb factory we had a working session in which we learned more in two hours by seeing than we could have learned in a year by reading.

Professor Ewell as President of the Society then pronounced the fifteenth annual meeting of the American Microscopical Society adjourned *sine die*.

During the afternoon the Executive Committee held their concluding session at the Fraternity House, which had so hospitably entertained a number of the members.

THE GUNDLACH OPTICAL WORKS.

After the close of the meeting the Secretary paid a visit to the factory of the Gundlach Optical Company, No. 173 Pinnacle avenue. They have a building 60 by 120 feet, well equipped with machinery for carrying on all branches of the manufacture of optical goods. Among the interesting facts may be noted that the son of one of the most famous American lens makers, and also a son of one of the celebrated European makers of microscopes and objectives are here working side by side. Let us hope that the influence of heredity will be exerted to its fullest extent. Of course the manufacture of the celebrated Gundlach photographic lenses occupies a prominent place in the output of this factory. The company now, however, are placing on the market a full line of microscopes, objectives and accessories, and in addition a line of general work is carried on, and some specialties, of which the manufacture of large glass mirrors used for search-lights is important. These mirrors are made of disks 60 to 70 centimeters in diameter, pressed while hot nearly into shape, then ground, polished, and silvered on the back. Another feature is the making of composite lenses for search-lights, made of strips of glass, forming segments of the lens, but movable, so as to throw a parallel or divergent beam.

REPORT OF THE TREASURER.

RECEIPTS.

Cash on hand August 12, 1891, at opening of meeting in Washington		$276 99
Cash received: dues for 1890	$ 4 00	
" " " 1891	28 00	
" " " 1892	527 00	
" " " 1893	16 00	
" " " 1894	2 00	
" " " 1895	2 00	
" " " 1896	2 00	
" " for admission fees of 46 new members..	138 00	
		719 00
" " from sale of Proceedings		48 76
		$1,044 75

EXPENDITURES.

Cash paid for printing, binding, mailing, engraving, etc., for volume of Proceedings for 1891	$611 45	
Cash paid for sundry expenses, stamps, freight, stationery, expenses of meeting, etc	255 13	
		$866 58
Cash on hand at opening of Rochester meeting, August 9, 1892.		178 17
		$1,044 75

REPORT OF CONDITION OF SPENCER-TOLLES FUND, AUGUST 8, 1892.

Balance on hand as per statement August 13, 1891	$292 88
Received interest to January 1, 1892	19 12
Total	$312 00

C. C. MELLOR,
Treasurer.

We hereby certify that we have examined the foregoing account, with the vouchers, and have found the same correct.

E. W. CLAYPOLE.
WILLIAM A. ROGERS.

ROCHESTER, *August 9, 1892.*

PRIZES FOR ORIGINAL WORK WITH THE MICROSCOPE.

By the Liberality of a Member.

The following sums of money have been placed at the disposal of the Society, to be given as prizes for the encouragement of microscopical research, and Professors Gage, Kellicott, and Seaman were appointed a committee to prepare the conditions on which they should be granted. The competition will be open to members of the Society and to those who make application for membership before submitting their papers to the committee.

Two prizes of fifty dollars.
Two prizes of thirty dollars.
Two prizes of twenty-five dollars.
Two prizes of fifteen dollars.

The committee have prescribed the following conditions:

One prize of fifty dollars for the best paper which shall give the results of an original investigation relating to *animal* life made with the microscope, and not less than 3,000 words in length. The methods by which the results were obtained to be given in full.

One prize of fifty dollars for the best paper which shall give the results of an original investigation made with the microscope and relating to *plant* life, not less than 3,000 words in length. The methods by which the results were obtained to be given in full.

Two prizes of twenty-five dollars each for the second best papers on animal and plant life, respectively, on the above conditions.

The papers, drawings, and specimens entered for the above prizes to be submitted to the committee on or before July 1, 1893, and the papers and drawings to be published in the Proceedings.

One prize of thirty dollars for the best six photomicrographs on some subject in animal or vegetable histology whose structural features are to be illustrated by the photomicrographs of the following amplification, viz., 50, 150, and 500, two of each. These are to be made by transmitted light, printed on albumen paper from untouched negatives, which, with the specimens from which they are made, are to be submitted with the pictures to the committee.

One prize of thirty dollars for the best collection of six mounted slides illustrating some one biological subject. These slides must

be accompanied with a full description of the method of preparation of the specimens.

Two prizes of fifteen dollars each for the second best collection of photomicrographs and slides, respectively, on the conditions above stated.

All photographs and mounted slides for which prizes are given are to become the property of the Society. The object of these prizes is to stimulate and encourage original investigation by the aid of the microscope in the biology of North America, and, while the competition is open to all, it is especially commended to advanced students in biology in such of our universities and colleges as furnish opportunity for suitable work.

If additional information is desired it may be obtained of the undersigned committee on prizes.

S. H. GAGE,
Ithaca, N. Y.
D. S. KELLICOTT,
Columbus, Ohio.
WM. H. SEAMAN,
Washington, D. C.